Excerpts from an Address to
THE 1966 CANADIAN INVESTMENT SEMINAR
University of Western Ontario
September 7-10, 1966

by

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Statistical Sources

Alberta Oil and Gas Conservation Board . American Association of Petroleum Geologists . American Gas Association . American Petroleum Institute . Canadian Petroleum Association . Chase Manhattan Bank . DeGolyer & MacNaughton . Dominion Bureau of Statistics . Imperial Oil Limited . The Independent Petroleum Association of Canada . The Oil and Gas Journal . Oilweek . Petroleum Outlook . Report of the Royal Commission on Energy . Shell Canada Limited . The Toronto-Dominion Bank . World Oil

The speech dealt with the untested petroleum potential of Western Canada and briefly reviewed how Dome and Provo fit into this picture.

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The oil industry has a lot in common with drug or alcohol addiction -- once you are bitten it is practically impossible to leave it alone. It is unlike most other industries in that one can cover up many mistakes and many dry holes by one lucky break.

One of the most famous and successful petroleum geologists of all time, Dr. Everette Lee DeGolyer, the founder of the consulting firm of DeGolyer and MacNaughton, often stated that it took a lot of skill and a lot of luck to be a success in the oil business. However, he said, "If I had to make a choice I would choose luck every time."

Some of the principal oilfields of Western Canada were discovered by accident in horizons that were not suspected to be oil or gas bearing at the time the discovery well was drilled. What I am actually saying is that most successful geologists should also be modest geologists.

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As the majority of you are aware, oil and gas are formed and usually found in marine sediments. The results of oil-finding efforts in the world to date have proven that the optimum areas for the discovery of large accumulations of oil and gas are located in and adjoining the mobile belts of thick sedimentary basins. By mobile belts, we mean areas where there has been considerable movement during and following the deposition of thick sections of marine sediments. These oscillations or earth movements tend to assist in the migration of the oil and gas and to create the structural and stratigraphic traps essential for the accumulation of large deposits of hydrocarbons. Examples of highly productive mobile belts throughout the world are the Persian Gulf, the Caspian Sea and the Maracaibo Basin of Venezuela.

Western Canada is blessed with an 1,800-mile long, thick, marine, sedimentary, mobile belt stretching from the United States border northwest along the front of the Canadian Rockies to the Arctic Ocean. In addition, an extension of this mobile belt swings northeast for another 1,500 miles through the Canadian Arctic Islands, for a combined total length of over 3,000 miles.

In 1957 Shell Oil Company and Imperial Oil Limited, a Standard (New Jersey) affiliate, conducted completely independent studies on the possible ultimate recoverable reserves that could be expected in the Western Canadian sedimentary basin and presented these findings in 1958 to a Canadian Royal Commission on Energy. Both of these independent studies took the known, proved, recoverable reserves from an average cubic mile of effective sediments in the United States and applied this average to the computed number of cubic miles of effective sediments in the Western Canadian sedimentary basin. The results of both of these studies projected a possible ultimate oil recovery for Western Canada of 45 to 50 billion barrels, exclusive of the Athabasca tar sand deposits and the Arctic Islands.

SLIDE #1 - shows the Western Canadian sedimentary basin, about which Shell made the following statement in 1958, "We have based our estimates on the already proved reserves of the United States and, as exploration continues, further large additions to reserves may be expected to be found there. Therefore, we should stress that we regard our estimates for Western Canada as minimum values." Shell continued, as follows: "Our estimate of 50 billion barrels plus that of the Athabasca reserves of 200 billion barrels, is apparently only 5% of the generative capability of the basin. These figures give us a feeling of confidence that our reserve estimates are well within the right order of magnitude."

Shell also in 1958 estimated that Western Canada's ultimate gas reserves would be at least 300 trillion cubic feet. In view of the subsequent market incentive and the resulting direct exploration for gas, we have estimated a possible ultimate gas reserve of 400 trillion cubic feet on the basis of the current ratio of the proved U.S. gas and oil reserves.

SLIDE #2 - shows the Arctic Island sedimentary basin of Canada, which encompasses approximately 350,000 square miles and approximately 500,000 cubic miles of effective sediments. The Arctic Islands have all of the qualities that a geologist looks for in his search for a potentially productive sedimentary basin, including thick marine sedimentation, major oil seeps, thick potential reef reservoirs and well-developed structures including numerous buried salt domes. Using the same parameters applied by Shell and Imperial to the Western Canadian basin, this Arctic Island area alone has an ultimate potential of recoverable reserves in excess of 25 billion barrels of oil and over 200 trillion cubic feet of gas.

These are not finite figures and can vary considerably, depending on what the company or the individual wants to prove. However, they are the result of detailed scientific research by two of the top oil-finding companies in the world, and are based on the reserves that had been proved and developed in similar sedimentary basins in the United States up to the end of 1957.

SLIDE #3 - shows the number of drilling rigs active during 1961 and 1965 in the prospective areas of Western Canada, the U.S.A. and the U.S.S.R. The millions of cubic miles of effective or potentially productive areas for each country are shown in their relative proportion in this slide. Although the number of active drilling rigs in Western Canada increased by 58% from 1961 to 1965, Canada still only has one-sixth of the rigs that are currently active in the United States or in Russia, despite Canada's excellent untested potential.

SLIDE #4 - shows the exploratory drilling density in the various prospective areas of Western Canada. You will note that one exploratory well has been drilled per 103,300 square miles of land area in the Arctic Islands, one exploratory well per 329 square miles in northeast British Columbia and the Northwest Territories, one exploratory well per 29 square miles in Alberta and one exploratory well per 41 square miles in Saskatchewan and southwest Manitoba. This works out to one exploratory well per 86.4 square miles of prospective area in Western Canada (including the Arctic Islands), as compared to an average of one exploratory well for each 6.9 square miles of prospective area in the United States.

SLIDE #5 - shows the exploratory drilling density per prospective square mile by wells that have at least tested the Devonian of Upper Paleozoic age. Only 44.7% of all exploratory wells drilled in Western Canada tested the highly potential Devonian or deeper horizons, where over 60% of Western Canadian proved oil and gas reserves have been found to date. That is, only one Devonian exploratory well has been drilled per 193 square miles of prospective area in Western Canada (including the Arctic Islands).

The potentials in these most prospective zones have therefore only been scratched and there is a great need for more deep tests to provide the essential sub-surface data which will lead to major future discoveries.

SLIDE #6 - shows that Alberta and Texas are approximately equal in size. They also have approximately the same square miles of potentially productive sedimentary basin area. This slide shows the relative drilling density in these approximately equal areas up to the end of 1965. As indicated on the slide, a total of only 8,057 exploratory wells have been drilled in Alberta through 1965, compared to 244,033 exploratory wells in Texas. Over the same period a total of 30,121 exploratory and development wells have been drilled in Alberta, compared to 553,459 wells in Texas. Although Alberta is the most thoroughly tested Province in Western Canada, there have been more than 30 exploratory wells drilled in Texas for each exploratory test drilled in Alberta.

SLIDE #7 - shows the annual additions to oil and gas reserves in the United States and in Western Canada per exploratory foot drilled. The gas has been converted to oil on a value basis of 20 thousand cubic feet of gas to 1 barrel of oil. Over the 5-year period from 1961 to 1965, each exploratory foot drilled in Western Canada found an average of 228 barrels of oil or oil equivalent of gas, as compared to an average of 80 barrels per exploratory foot drilled in the U.S. during the same period. That is, each exploratory foot drilled in Canada finds approximately 2.8 times as much oil and/or gas as an exploratory foot drilled in the U.S.

SLIDE #8 - shows the cost per barrel of finding and developing oil and gas reserves in the U.S. compared to Western Canada. This slide illustrates that the average cost over the 5-year period 1961 through 1965 of finding and developing a proved barrel of oil or oil equivalent of gas in the U.S. was $1.16 (Canadian), compared to 47¢ per barrel in Western Canada. This cost figure includes gas and recycling plants, secondary recovery projects and lease bonuses. The cost per barrel reflects changes in reserves resulting from discoveries and successful pressure maintenance projects. The 1965 figure for the U.S. was not available and has been estimated. The 1965 figure for Canada includes relatively conservative estimates of proved reserves at the Rainbow oil field and the Gold Creek gas field.

SLIDE #9 - shows the relative size of the Western Canadian sedimentary basin (exclusive of the Arctic Islands) with the six most productive States in the United States superimposed thereon. The States of Louisiana, California, Kansas, Oklahoma, Wyoming and Texas contain in excess of 88% of the proved reserves of the United States. It is interesting to note that the area of Wyoming is approximately 14% of the prospective sedimentary area of Western Canada and its production equals 45% of the oil produced in Western Canada during 1965. The area of Lousiana is less than 7% of the potentially productive area of Western Canada and yet produces twice as much oil.

Up to the end of 1965, approximately 9.9 billion barrels of recoverable crude oil and 54.9 trillion cubic feet of gas have been developed in Western Canada. Of these, a total 2.7 billion barrels of oil and 9.6 trillion cubic feet of gas have been produced. Up to the end of 1965 over 110 billion barrels of oil and 551 trillion cubic feet of gas have been developed in the U.S., of which approximately 79 billion barrels of oil and 265 trillion cubic feet of gas have been produced.

SLIDE #10 - shows the U.S. annual crude oil and condensate production compared to the life index of proved reserves at current annual production rates. The slide indicates that despite the continuous increase in U.S. oil production over the past 10

years, from 2.9 billion barrels in 1956 to 3.2 billion barrels in 1965, the remaining reserve years at current annual production have remained approximately the same. Over the period from 1933 to 1965 the life index of proved U.S. oil reserves has varied between 12 and 14 years, despite an approximate tripling of the annual production during that same period. This indicates what a market will do to the oil-finding effort.

SLIDE #11 - shows Western Canada's annual crude oil and condensate production compared to the life index of proved reserves at current annual production rates. The relatively rapid increase in the market for Canadian crude, created by the National Oil Policy, is reflected in the years 1961 to 1965. The 1965 life index of 24.2 years (double that of the U.S.) has been increased substantially in 1966 by additions to reserves, mainly in the Rainbow area, with many untested prospects awaiting the winter drilling season.

SLIDE #12 - illustrates Western Canadian oil, condensate and LPG actual and potential production. This slide shows that Canada is producing approximately 50% of its current producibility, exclusive of proved Rainbow potential. With many undrilled Rainbow-type geophysical prospects and the high success ratio in that area to date, Canada's potential is expected to grow much more rapidly than its market.

SLIDE #13 - shows Canada's oil and gas reserves. As of the end of 1965 there were 45.4 trillion cubic feet of proved gas reserves, equivalent to 2.3 billion barrels of oil. Proved oil and condensate reserves totalled 8.2 billion barrels and the combined oil and gas reserves totalled 10.5 billion barrels, including conservative 1965 additions at Rainbow oil field (1/2 billion barrels) and at Gold Creek gas field (one trillion cubic feet), which were not included in the C.P.A. figures.

It should be noted that proved oil and condensate reserves approximately doubled in the last 5 years from 4.2 billion barrels at the end of 1960 to 8.2 billion barrels at the end of 1965, for an average increase of 800 million barrels per year. The new Keg River potential, productive at Rainbow and stretching over a large segment of Western Canada, should improve this average rate of annual addition to reserves.

The lack of markets for petroleum products between the Suez crisis of 1956 and the National Oil Policy in 1961 practically eliminated the incentive to explore for new oil reserves. All of the oil companies drastically reduced their seismic and exploration parties and drilled the minimum number of exploratory wells required to hold their permits. The increased market created by the National Oil Policy in 1961 did not appreciably affect the discovery trend and total reserves until late 1964 and 1965, due to the lag between a new exploration effort and the results. This is why we must have an immediate up-dating of the National Oil Policy to create expanding markets in order to

maintain our current exploratory momentum and discovery trend.

SLIDE #14 - shows Canada's refined petroleum product consumption, crude oil and condensate production, crude oil and refined product imports and crude oil and refined product exports. This slide shows that Canada is currently importing 245,000 barrels of oil and product per day more than it is exporting, even though Canada can produce over 150% of its current consumption. This excess of imports over exports amounts to an annual expenditure of $260 million. As the consumption of refined products is growing more rapidly in the areas supplied by off-shore crude, imports are supplying more than 65% of Canada's recent increases in consumption.

SLIDE #15 - shows Canada's 1965 oil supply picture. 395,000 barrels per day of crude oil and 160,000 barrels per day of refined product, for a total of 555,000 barrels a day are currently being imported into Canada, essentially into the area east of the Ottawa valley. Exports total 310,000 barrels per day of crude oil and refined products, mainly into the Minneapolis and Puget Sound areas.

SLIDE #16 - shows the laid down cost per barrel of Alberta crude oil at specific market areas, as compared to the laid down cost of equivalent quality off-shore or U.S. crude.

That, essentially, is the industry picture.

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As many of you are aware, I represent two fairly vigorous Canadian independent oil and gas companies, namely, Dome Petroleum Limited and Provo Gas Producers Limited. I will briefly outline this morning, by means of graphs, how these two companies have fared to date in the total Canadian picture.

Dome was formed in 1950 and went public in 1951. Outstanding shares total 2,613,700, for which $10,700,000 was subscribed. The original debt totalled $7.7 million, all of which has now been retired. From a standing start in 1950, Dome has developed total net proved reserves of 98.8 million barrels of oil and oil equivalent of gas converted on a value basis.

SLIDE #17 - shows the total net proved reserves developed from 1956 to 1965. Of the 98.8 million barrels developed through 1965, 19.8 million barrels have been produced, 22.9 million barrels have been sold or traded for shares and 56.1 million barrels remain as net proved reserves.

In addition, Dome holds a 38% controlling interest in Provo Gas Producers Limited, which owns proved oil and oil equivalent of gas reserves totalling over 36 million barrels.

Dome currently owns a total of approximately 3.5 million net acres and Provo approximately 1.1 million net acres.

SLIDE #18 - shows the gross and net wells drilled by Dome Petroleum for the years 1956 through 1965. As you will see, Dome has retained an approximate 50% average interest in all wells drilled during the past 3 years.

SLIDE #19 - shows the gross and net wells drilled by Provo for the years 1956 through 1965. Provo has been under Dome's management since 1956 and its entire staff is provided by Dome. Since 1960 Dome has assigned to Provo a one-third interest in all of its plays except in specific areas where Dome or Provo had prior commitments. As a result, most of the wells drilled by Provo since that date were in partnership with Dome.

SLIDE #20 - illustrates the financial growth of Dome during the years 1956 through 1965. In 1965 the gross income totalled $7,148,000, the cash flow totalled $5,507,000, or $2.11 per share, and the net income was $4,064,000, or $1.56 per share. During the last five years Dome's net income has increased an average of 187.6%. Although each year has shown a major increase, this high average results primarily from the substantial percentage increase that occurred in 1961, when net income rose to $1,110,000 from $126,000 in 1960.

You will note that Dome adopted full-cost accounting as of January 1, 1965.

SLIDE #21 - illustrates the financial progress of Provo during the years 1956 through 1965. In 1965 the gross income totalled $7,197,000, the cash flow totalled $3,451,000, or 41¢ per share, and the net income was $1,724,000, or 20¢ per share. During the last five years Provo has shown an average of 40.6% increase in gross and 51.1% increase in net income.

Provo also adopted full-cost accounting as of January 1, 1965.

SLIDE #22 - is an evaluation of Dome's assets as of December 31, 1965. The proved oil and gas reserves were calculated by James A. Lewis Engineering of Dallas

and Calgary. The values assigned per barrel of oil and per thousand cubic feet of gas are their present worth or discounted value after deducting all operating costs, capital expenditures for pressure maintenance projects and a 6% discount. These reserve figures exclude all probable reserves and reserves attributable to significant oil and gas discoveries drilled in late 1965.

Under investments we have shown Dome's holdings of Provo stock at its present worth value per share, calculated on the same basis as Dome's. The non-producing acreage values are the result of a 1965 appraisal and include acreage containing probable and possible oil and gas reserves adjoining company-owned producing properties. As an example, the values assigned to Dome's 33,878 net acres in the Zama Lake area were $50 per acre. Recent Crown reserve wildcat land purchases adjoining the company's lease blocks ranged between $1,000 and $4,200 per acre.

No allowance has been made for income tax. Dome currently has tax credits in excess of $6.5 million and has been able to maintain these credits for a number of years by active exploratory and development drilling programs. No tax should therefore be payable for a minimum of five years.

Dome's total net asset value is indicated at approximately $87 million, or $33.25 per share.

SLIDE #23 - is an evaluation of Provo's assets as of December 31, 1965. This appraisal is also based on proved reserves as determined by James A. Lewis Engineering, with all future net income from reserves discounted at 6%. These reserves exclude probable reserves, heavy gravity oil reserves and late 1965 gas and oil discoveries, due to the need to keep the latter confidential. Provo's non-producing acreage values were appraised in the same conservative manner used for Dome and do not reflect the recent land prices paid in the Zama Lake - Steen River areas, where Provo holds 16,939 net acres. No allowance was made for income tax as Provo has a total of $22 million in tax credits. You will note that Provo's investments in gas plants, salt storage facilities, propane marketing and products pipeline are shown at cost.

Provo's total net asset value is indicated at approximately $40 million, or $4.76 per share.

SLIDE #24 - shows Dome and Provo's acreage holdings in the Zama Lake -Steen - Bistcho area some 45 miles north of the Rainbow Lake oil pools.

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Dome is essentially an oil and gas producing company, but through its 38%-owned affiliate, Provo, it holds a major interest in 3 large gas plants in Western Canada. The companies produce approximately 60 million Canadian gallons of liquid product annually. In addition, through Provo, Dome participates in a 100%-owned LPG marketing organization (Steelgas Limited) which wholesales approximately 80 million gallons of product annually and retails approximately 14 million gallons of propane gas, principally in the mining centres of northern Manitoba.

I will close this portion of my presentation with a quotation on Canada's potential, which was made over 20 years ago by that great world statesman, Sir Winston Churchill, who said,

> "A magnificent future awaits Canada. Upon the whole surface of the globe there is no more spacious and splendid Domain open to the activities and genius of Free Men."

As a geologist, employed for over 30 years in the search for and development of natural resources in various parts of the world, I concur. All we need are expanding markets for our products and your faith in the form of risk capital to develop this great Domain.